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(54)【考案の名称】　薄板用支持容器

【実用新案登録請求の範囲】

【請求項１】　円盤状の薄板を多段にかつ等間隔に支持すべく多数のリブ片を多段に配設した支持用リブを並列に相対向して備え、一方の開口部が前記薄板を導入又は導出させる導入出口となる薄板用支持容器において、前記リブ片を、前記薄板の導入又は導出が容易なように、その全長に亘って肉薄に成形してリブ片間隔を広くし、内部に挿入された薄板の重心を通るその導入、導出方向に直交する直線が前記相対向して備えられた各支持用リブと交わる点より前記導入出口側の当該リブ片位置に、内部に挿入された薄板を下側から支持する支持用凸部を設けると共に、前記リブ片の最奥側に、薄板の挿入限度を規制すると共に薄板を奥側から支持する奥側支持部を設け、
前記薄板が奥側支持部に当接して限度位置まで挿入された状態で、この奥側支持部と前記支持用凸部とで薄板を水平に支持することを特徴とする薄板用支持容器。

【考案の詳細な説明】

【０００１】

【産業上の利用分野】本考案は、半導体ウエハ等の薄板を複数枚等間隔をおいて多段に収納支持し、保管、運搬、洗浄、エッチング及び乾燥等の処理を複数枚まとめて行う薄板用支持容器に関する。

【０００２】

【従来の技術】薄板を複数枚同時に収納支持して保管、洗浄、エッチング等の処理を行う薄板用支持容器としては、例えば薄板として半導体ウエハを用いた半導体ウエハ用キャリアボックス１が知られている。この半導体ウエハ用キャリアボックス１を図２に基づいて説明する。図２は半導体ウエハ用キャリアボックス１の対向する一

対の側板の一方のみを内側から示す一部破断斜視図である。

【０００３】半導体ウエハ用キャリアボックス１は、一方を開口して構成され、ウエハ７（図４参照）を導入及び導出するウエハ導入出口２Ａを有する筐体２と、この筐体２の互いに対向した２枚の側板３の内側面にそれぞれ多段に設けられ、複数枚のウエハ７を並列にかつ多段に収納支持する支持用リブ５とから概略構成されている。

【０００４】各支持用リブ５は、側板３に一定間隔をおいて並列に設けられた多数のリブ片５Ａから構成されている。このリブ片５Ａは断面形状を肉薄に成形され、隣り合うリブ片５Ａの間隔を大きく取ってある。

【０００５】各支持用リブ５の最奥部には互いに内側へ向け湾曲させて成形された最奥支持部５Ｂが設けられ、挿入されたウエハ７の挿入限度を規制し位置決めをするようになっている。

【０００６】筐体２の一側面（図２中の左側面）には、この筐体２を縦（内部に挿入されたウエハ７を水平に支持する状態）に置いたときに、内部に挿入されたウエハ７が水平になるように筐体２を支持する水平支持板部６が設けられている。

【０００７】以上の構成の従来の半導体ウエハ用キャリアボックス１にあっては、複数のウエハ７を並列にかつ多段に支持して、これら複数のウエハ７をボックス１ごと洗浄液に浸ける洗浄処理等を行う。

【０００８】そして、この半導体ウエハ用キャリアボックス１へのウエハ７の導入及び導出に際しては、自動ウエハ移載機（図示せず）が使用される。この自動ウエハ移載機としては、半導体ウエハ用キャリアボックス１内へウエハ７を挿入するローダ（図示せず）及びキャリアボックス１内からウエハ７を挿出するアンローダ（図示せず）が用いられる。

【０００９】一方、近年の半導体産業の著しい技術革新により、ＩＣの微細加工が可能となり、ますます集積度が高まった。それに伴い、塵埃の発生が問題になってきた。このため、発塵の原因となるものが制限されるようになり、自動ウエハ移載機においても、従来の移載方式から、ウエハ７を半導体ウエハ用キャリアボックス１から一枚ずつロボットで出し入れする方式に変ってきた。

【００１０】このロボットは、図３に示すフォーク８を有し、このフォーク８を半導体ウエハ用キャリアボックス１に収納された隣り合う２つのウエハ７の間に挿入して上側に位置するウエハ７を僅かに持上げ、外部に導出する。また、フォーク８を多段に配設して複数枚のウエハ７を同時に導入、導出するものもある。

【００１１】

【考案が解決しようとする課題】ところで、前述のような半導体ウエハ用キャリアボックス１では、成形時の収縮、離型等を考慮して余裕を持たせた寸法に設定されているため、各リブ片５Ａの間隔、対向する各支持用リブ５の間隔はウエハ７の寸法に比べて大きく設定されている。さらに、各支持用リブ５の間隔は、ウエハ導入出口２Ａに向けて徐々に広がったテーパ状に成形されている。このため、ウエハ７は半導体ウエハ用キャリアボックス１に挿入支持された状態で前後左右に移動できるようになっており、仮に前後、左右に移動すると、図４に示すように、移動方向に傾いて水平度が悪くなる。そして、ウエハ７が傾いて水平度が悪くなると、隣り合うウエハ７間の隙間寸法が不均一になり、フォーク８をウエハ７の間に挿入する際に、フォーク８がウエハ７に接触して発塵したり、ウエハ７を支持して導出する際にウエハ７とリブ片５Ａとが互いに接触し擦りながら移動して発塵したりすることがある。そして、この発塵がウエハ７の歩留り率の低下の原因になるという問題点がある。

【００１２】本考案は以上の問題点に鑑みなされたもので、ウエハを水平に正確に支持して導入又は導出の際の発塵を抑えることができる薄板用支持容器を提供することを目的とする。

【００１３】

【課題を解決するための手段】本考案は前記課題を解決するために、円盤状の薄板を多段にかつ等間隔に支持すべく多数のリブ片を多段に配設した支持用リブを並列に相対向して備え、一方の開口部が前記薄板を導入又は導出させる導入出口となる薄板用支持容器において、前記リブ片を、前記薄板の導入又は導出が容易なように、その全長に亘って肉薄に成形してリブ片間隔を広くし、内部に挿入された薄板の重心を通るその導入、導出方向に直交する直線が前記相対向して備えられた各支持用リブと交わる点より前記導入出口側の当該リブ片位置に、内部に挿入された薄板を下側から支持する支持用凸部を設けると共に、前記リブ片の最奥側に、薄板の挿入限度を規制すると共に薄板を奥側から支持する奥側支持部を設け、前記薄板が奥側支持部に当接して限度位置まで挿入された状態で、この奥側支持部と前記支持用凸部とで薄板を水平に支持することを特徴とする。

【００１４】

【作用】前記構成により、導入部のリブ片を肉薄に成形してリブ片間隔を広くすることで、薄板の導入又は導出が容易になり、薄板と支持容器とが摩擦することがなくなる。

【００１５】また、薄板の重心を通る直線と各支持用リブとの交点の導入出口側位置に設けられた支持用凸部と、リブ片の最奥側に設けられた奥側支持部とで、薄板を支持するので、薄板を水平に精度よく安定して支持することができ、ロボットのフォークを薄板間に接触することなく確実に挿入することができるようになる。

【００１６】

【実施例】以下、本考案の実施例を添付図面に基づいて説明する。本考案の薄板用支持容器は、半導体ウエハ、

記憶ディスク、液晶板等の薄板を複数枚並列に支持する容器である。以下、薄板として半導体ウエハを、薄板用支持容器として半導体ウエハ用キャリアボックスを用いた場合を例に説明する。

【００１７】［第１実施例］

本実施例の半導体ウエハ用キャリアボックス１０の全体構成は前述した従来の半導体ウエハ用キャリアボックス１とほぼ同様である。具体的には、図１及び図５に示すように、一方を開口して構成し半導体ウエハ１１を導入及び導出するウエハ導入出口１２Ａを有する筐体１２と、この筐体１２の互いに対向した２枚の側板１３，１４の内側面にそれぞれ多段に設けられ、複数枚のウエハ１１を並列にかつ多段に収納支持する支持用リブ１５とから構成されている。

【００１８】筐体１２は、対向する２つの側板１３，１４を上側連接板１６と下側連接板１７とで互いに接続支持して構成されている。この筐体１２は、下側連接板１７側を下にして縦に載置される。各側板１３，１４の下側には、筐体１２を縦に載置したときに、内部に支持したウエハ１１が水平になるように筐体２を支持するための基準面１８Ａとなる水平支持板部１８が設けられている。ウエハ導入出口１２Ａはウエハ１１を導入及び導出する開口部で、円形のウエハの最大直径よりも多少大きい程度の寸法に設定されている。

【００１９】支持用リブ１５は、側板１３，１４内側に一定間隔をおいて並列に設けられた多数のリブ片１５Ａから構成されている。この支持用リブ１５は、ウエハ導入出口１２Ａ側に位置する導入部２０と、この導入部２０の奥側に位置する整合部２１と、最奥側に位置しウエハ１１の挿入限度を規制すると共にウエハ１１を奥側から支持する奥側支持部２２とから構成されている。導入部２０では、ウエハ１１をボックス内に導入するとき又は導出するときに、その導入又は導出が容易なように、リブ片１５Ａを従来技術と同じように、肉薄に成形してテーパの角度を鋭角にしリブ間隔を広くしている（図４参照）。

【００２０】整合部２１では、図６に示すように、リブ片１５Ａを肉厚に成形してテーパの角度を鈍角にし、リブ間隔を狭くしている。このリブ片１５Ａの厚さ（テーパ角）は、最奥まで挿入されたウエハ１１が基準面１８Ａと平行になるように、設定されている。即ち、ウエハ１１がボックス内に最奥まで挿入されると、このウエハ１１は最大外径点２５，２５（図５参照）と奥側支持部２２，２２の４点で支持されるが、この４点で支持されたときにウエハ１１が基準面１８Ａと平行になるように、リブ片１５Ａの上側面の成形位置が設定されている。なお、ウエハ１１は円形であるので、ウエハ１１の重心に対応する位置は最大外径点２５，２５になる。

【００２１】さらに、リブ片１５Ａの下側面は、隣り合う２つのリブ片１５Ａの間隔を狭めてウエハ１１の最大外径部分でこのウエハ１１の左右への移動が規制される程度に設定されている。さらに、整合部２１は前記最大外径点２５，２５より僅かにウエハ導入出口１２Ａ側まで設ける。

【００２２】以上のように構成された半導体ウエハ用キャリアボックス１０にウエハ１１を挿入するときは、このウエハ１１がフォーク８（図３参照）で水平に支持され、挿入位置まで移動されてボックス１０内へ挿入される。このときの位置は、整合部２１のリブ片１５Ａの部分でウエハ１１の最大外径分が接触しない高さに調整され、ウエハ１１の挿入時にリブ片１５Ａに接触しないようになっている。

【００２３】この位置を保った状態でウエハ１１がボックス１０内に奥側支持部２２に当接するまで挿入される。挿入の際には、導入部２０でのリブ片１５Ａの間隔が大きいので、容易に挿入される。ウエハ１１が奥側支持部２２に当接するまで挿入されると、フォーク８が僅かに下方へ移動してウエハ１１は整合部２１のリブ片１５Ａに載置される。この状態で、ウエハ１１は奥側支持部２２と整合部２１とで支持され、このウエハ１１の左右方向への移動がリブ片１５Ａの上下側面で、前後方向への移動が奥側支持部２２でそれぞれ規制され、ウエハ１１は水平度を保って載置され、各ウエハ１１間の隙間寸法が均一になる。

【００２４】ボックス１０内に多段に収納されたウエハ１１を取り出すときは、前記フォーク８を各ウエハ１１の間に挿入する。このとき、各ウエハ１１は正確に水平支持されているので、各ウエハ１１間の寸法も均一になっており、フォーク８がウエハ１１に接触することがなくなる。フォーク８が奥まで挿入すると、このフォーク８が僅かに上方へ移動されてウエハ１１を持上げる。そして、フォーク８が外部へ引出されてウエハ１１が導出される。このとき、フォーク８によるウエハ１１の上方への移動量は、このウエハ１１の最大外径部分が整合部２１のリブ片１５Ａの下側面に接触しない程度に設定される。なお、ウエハ１１の載置位置が多少ずれて接触したとしても整合部２１は最大外径点２５，２５付近までしか成形されていないため、整合部２１とウエハ１１とが摩擦する部分は僅かな距離に過ぎない。

【００２５】以上のように、本実施例の半導体ウエハ用キャリアボックス１０では、ウエハ１１を正確に水平支持することができるので、ウエハ１１の導入、導出の際に、各部の接触による発塵を防止することができる。

【００２６】また、フォーク８を挿入するときにもウエハ１１とフォーク８とが接触することがなくなり、ウエハ１１の破損、作業ラインの停止等の発生を確実に防止することができる。

【００２７】［第２実施例］

本実施例の半導体ウエハ用キャリアボックス３１の全体構成は、前記第１実施例と同様である。本実施例におい

ては、図７に示すように、支持用リブ３２の構成を異ならせている。即ち、支持用リブ３２を構成するリブ片３３は全体を肉薄に成形され、リブ片３３の間隔はその全長に亘って広くしている。そして、図７に示すように、リブ片３３に、ウエハ１１を水平に支持する支持用凸部３４が設けられている。この支持用凸部３４は最大外径点２５，２５の近傍（多少ウエハ導入出口１２Ａ側）に、即ち内部に挿入されたウエハ１１の重心を通るその導入、導出方向に直交する直線が、相対向して備えられた各支持用リブ３２と交わる点よりウエハ導入出口１２Ａ側のリブ片３３位置に設けられ、この２つの支持用凸部３４と奥側支持部２２とでウエハ１１が４点支持される。支持用凸部３４の大きさは、最大外径点２５，２５近傍でウエハ１１を支持できればよいため、僅かな幅（リブ片１５Ａの長手方向への幅）に設けても、ある程度大きな幅に設けてもよい。

【００２８】この支持用凸部３４はくさび状に成形され、その上側面が水平になるように、かつ対向する２つの支持用凸部３４の高さが同一になるようになっている。さらに、この支持用凸部３４の高さは奥側支持部２２の高さと同一になっている。これにより、ウエハ１１は奥側支持部２２と支持用凸部３４とで４点支持された状態で、多少左右にずれても、水平状態が維持される。

【００２９】以上の構成により、前記第１実施例と同様の作用、効果を奏することができる。

【００３０】なお、前記各実施例では、薄板として半導体ウエハ１１を用いた場合を例に説明したが、これに限らず、アルミニウム製の記憶ディスクやガラス製の液晶板等を収納支持する支持容器の場合にも、前記同様の作用、効果を奏することができる。

【００３１】また、前記各実施例では、ウエハ１１を奥側支持部２２を含む４点で支持するように構成したが、この奥側支持部２２を設けずに、互いに平行する部分（第１実施例における導入部２０と整合部２１に対応する部分）だけで構成した場合にも、前記同様の作用、効果を奏することができる。この場合、第１実施例では整合部２１でウエハ１１を４点支持することになる。第２実施例では支持用凸部３４を４ヵ所に設けることになる。これは特に液晶板等の４角形のものを支持する場合に有効である。

【００３２】第１実施例では、整合部２１を最大外径点２５，２５より僅かにウエハ導入出口１２Ａ側まで設けたが、ウエハ導入出口１２Ａ側へ大きく設けてもよい。

【００３３】また、整合部２１のリブ片１５Ａを肉厚にする部分を、リブ片１５Ａの長手方向全域に設けたが、最大外径点２５，２５の近傍にだけ設けてもよい。

【００３４】第２実施例では、くさび状の支持用凸部３４を設けたが、図８に示すように、突起状の支持用凸部３５としてもよい。この場合にも第２実施例同様の作用、効果を奏することができる。

【００３５】また、支持用凸部３４は片側（リブ片１５Ａの上側面）にだけ設けたが、両側（リブ片１５Ａの対向する上側面と下側面）に設けてもよい。この場合は、ボックス１０を横にして（ウエハ導入出口１２Ａを上にして）奥側支持部２２側から各ウエハ１１を押し上げて取り出すときにウエハ１１が振れず、取出しが容易になる。

【００３６】また、支持用凸部としては、図９に示すように、リブ片３３の最奥部に下方へ向けて傾斜した形状の支持用凸部３６としてもよい。この支持用凸部３６の取り付け位置は、最大外径点２５，２５付近でも全体でもよい。この場合、支持用凸部３６でウエハ１１の下側面が支持されることで、ウエハ１１の上側がリブ片３３の下側面に近接し、ウエハ１１の左右へのずれが規制され、ウエハ１１が傾くのを防止することができる。

【００３７】

【考案の効果】以上詳述したように、本考案の薄板用支持容器によれば、薄板を水平に正確に支持することができるようになり、薄板の導入又は導出の際に、薄板と容器との接触等による発塵を抑えることができるようになる。

【図面の簡単な説明】

【図１】本考案に係る半導体ウエハ用キャリアボックスを示す一部破断斜視図である。

【図２】従来の半導体ウエハ用キャリアボックスを示す一部破断斜視図である。

【図３】フォークを示す平面図である。

【図４】従来のキャリアボックスにおけるウエハの載置状態を示す部分断面図である。

【図５】図１の半導体ウエハ用キャリアボックスの横断面図である。

【図６】第１実施例に係るキャリアボックスにおけるウエハの載置状態を示す部分断面図である。

【図７】第２実施例に係るキャリアボックスにおけるウエハの載置状態を示す部分断面図である。

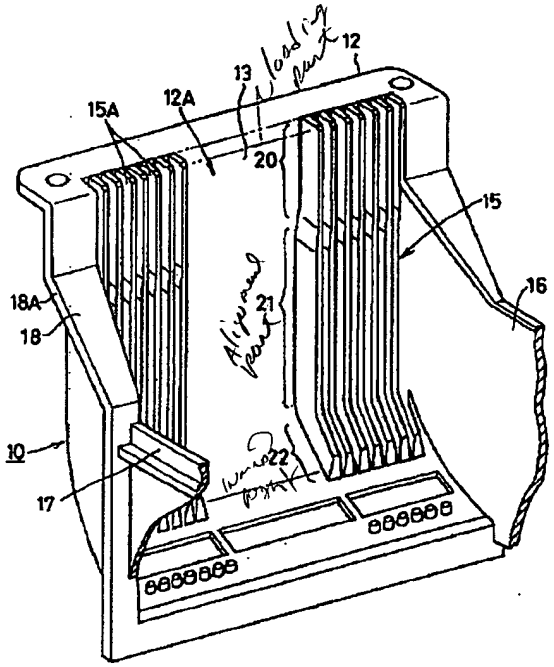
【図８】第２実施例の変形例を示す部分断面図である。

【図９】第２実施例の他の変形例を示す部分断面図である。

【符号の説明】

１０…半導体ウエハ用キャリアボックス、１１…半導体ウエハ、１２…筐体、１２Ａ…ウエハ導入出口、１３，１４…側板、１５…支持用リブ、１５Ａ…リブ片、１８…水平支持板部、１８Ａ…基準面、２０…導入部、２１…整合部、２２…奥側支持部。

【図１】



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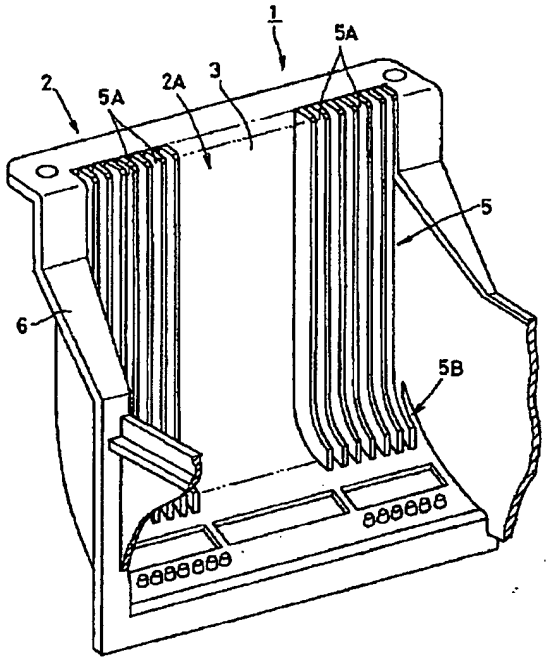
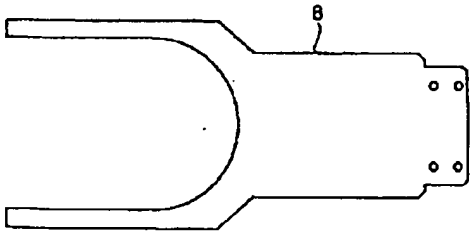


【図３】



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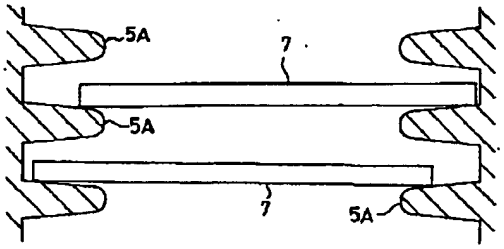

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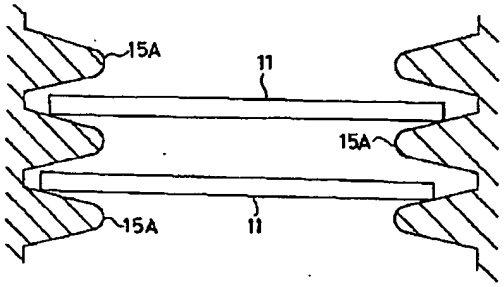

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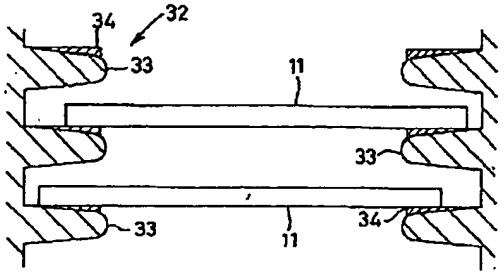
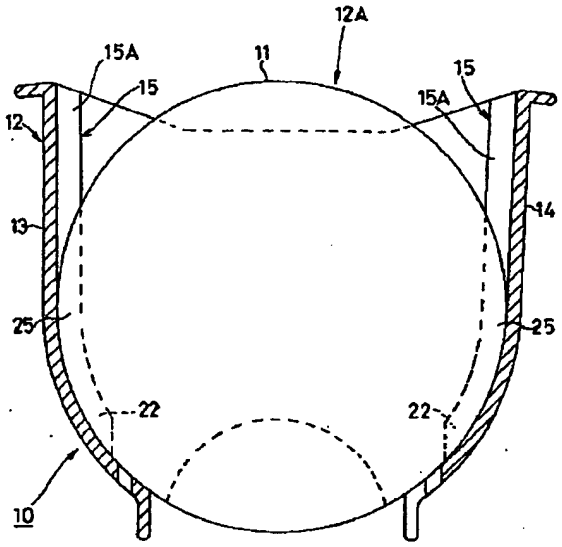


【図５】



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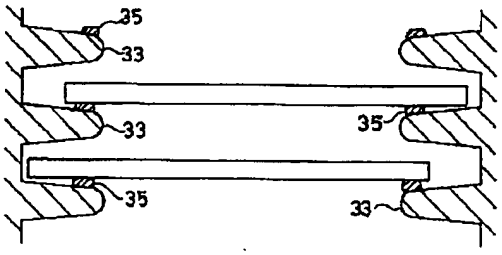
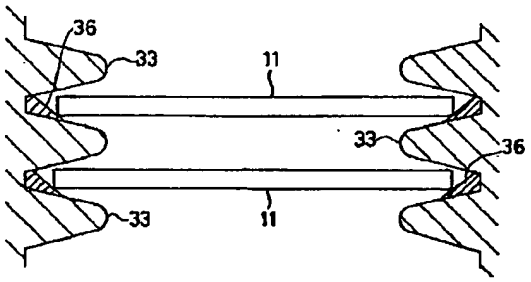


【図９】



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(56) [Cited References]
(2) [Cited Reference] Toku-Kai-Hei 02-209746 (JP, A)

[Cited Reference] Jitsu-Kai-Sho 61-175614 (JP, U)

[Scope of the Claim for the New Design for Practical Use]

[What is Claimed: 1] A support container for thin plates characterized in that such a container has support rib segments arranged in such a way that they face one another and are comprised of multi-layers so that disk-shaped thin plates can be supported in many layers, and in an equal distance from one thin sheet from another; that the support container, where one end of the opening part thereof is arranged to allow said thin plates to be loaded or unloaded, can allow said rib segments to be arranged in an increased space throughout the entire length of the thin sheet and formed thinly so that said thin plates can be easily loaded or unloaded, wherein a support convex part that supports the thin plates from downward, which are inserted internally from the point, where the straight line passing toward the direction of the loading/lead-out diagonally through the center of gravity of the internally inserted thin plates meets individual support ribs that are arranged to face one another, to one side of said rib segments of said loading/lead-out part; and that the inner most side of said rib segments has a inner most support part, which controls the insertion depth limit of the thin plates by supporting the thin plates from the inner location thereof, wherein as said thin plates contact the inner most support part and are inserted to the limit point, which allows the container to horizontally support the thin plates by this inner most support part and said support convex part.

Detailed Explanation

[Detailed Explanation of the Invention]

[0001]

[Applications in Industrial Purposes] The present invention relates to a support container for thin plates, being able to support a plurality of thin plates such as semi-conductor wafers at a certain space in multiple layers in a sustainable fashion, which is used for processes that are applicable to a plurality of said thin plates such as storage, transportation, cleaning, etching, and drying.

[0002]

[Existing Technique] As a support container for thin plates in order to process, for example, storage, cleaning, and etching, wherein a plurality of thin plates can be stored, carrier box for semi-conductor wafers, where thin plates are represented by semi-conductor wafers, carrier box for semi-conductor wares, has been known. Illustration will follow regarding this carrier box for semi-conductor wafers 1 with reference to Figure 2. Figure 2 is a partial cut out view, showing only one internal side of the facing pair of sides of carrier box for semi-conductors 1.

[0003] The carrier box for semi-conductor wafers 1 is formed to be open at one end, being conceptually comprised of a body 2 having a wafer input/output opening. 2A for a wafer 7 (see also Figure 4), and a support rib 5 that are arranged in a plurality of layers inside the pair of side boards 3 facing each other inside the body 2.

[0004] Individual support ribs 5 are comprised of a plurality of rib segments 5A that are arranged in a parallel manner at a constant space on the side board 3. The rib segment 5A is formed to be thin in its cross-section, and adjacent rib segments are separated at a wide space.

[0005] The inner most point of each support rib 5 has the inner most supporting part 5B, which is formed in such a way that individual ribs are internally wound, wherein the insertion depth of an inserted wafer 7 can be controlled and fixed to a certain position.

[0006] On one side (see also the left figure of Figure 2) of the body 2 is a horizontal support board part 6 that supports the body 2 with maintaining the internally inserted wafer 7 horizontal when the body 2 is set up in a vertical position (which means the state where the internally inserted wafer 7 can be horizontally kept).

[0007] With regard to the existing carrier box for semi-conductor wafers 1 having the construction just as described above, a plurality of wafers 7 are to be supported in a parallel and multi-layer fashion, and they are batched as a box 1 for the processes such as a cleaning process where the entire box is to be submerged into the cleaning solution.

[0008] And an automated wafer conveyer (no figure is provided) is used for loading and unloading the wafers 7 to the carrier box 1. As such an automated wafer conveyer, a loader (no figure is provided) that inserts a wafer 7 into

the carrier box for semi-conductor wafers 1, and an unloader (no figure is provided) that feeds a wafer 7 to the carrier box 1 are to be used.

[0009] On the other hand, due to the amazing technological innovations in the semi-conductor industry, minute processing of integrated circuits (IC's) can be achieved, which in turns has increased the density of integration more and more. Along the line with the discussion made above, generated dust has come to draw attention as problems. For this reason, what might generate dust has been regulated; on the automated carrier, as well, the conventional conveyer method has been replaced with the method whereby a wafer 7 is to be fed in and out the carrier box for semi-conductor wafers 1 one wafer by one with the assistance of utilizing robots.

[0010] The robot has a forklift 8 as described in Figure 3, inserts the forklift 8 between adjacent two (2) wafers 7 stored in the carrier box for semi-conductor wafers 1, and lift the top side wafer 7 slightly to get it unloaded externally. Moreover, there is another type that a forklift 8 is arranged in a multi-layer manner, which allows a plurality of wafers 7 can be simultaneously loaded and unloaded.

[0011]

[Issues that the Invention Is Trying To Solve] Incidentally, the carrier box 1 for semi-conductor wafers just as described above is designed with larger size, taking into consideration the contraction and release among other things at the timing of forming; thus, the space between each rib segment 5A, and the space between individual support ribs 5 that face one another are set to a relatively large dimension, compared with the dimension of the wafer 7. Furthermore, the space between individual support ribs 5 is formed in a taper-like manner where the space becomes larger toward the wafer loading/unloading opening 2A. For this reason, the wafer 7 can be moved back and forth, right and left with its state being inserted and supported into the carrier box 1 for semi-conductor wafers; if it is moved back and forth, right and left, just as described in Figure 4, the wafer gets inclined in the direction of movement, thus reduced flatness. Now that the flatness is being reduced due to the inclination of the wafer 7, the space dimension of the adjacent wafers 7 become inconsistent; when the forklift 8 extends to the wafers 7, contact between the forklift 8 and wafers 7 might generate dust, and movement with contact and friction of the wafers 7 and rib segments 5A in an attempt to introduce and unloading the wafers could generate dust, as well. Consequently,

the resulting dust could be one of the causes of the problem of reducing the yield rate of the wafers 7.

[0012] The present invention is pondered upon the problems as discussed above, and aims at providing a support container for thin plates that can support the wafers in an accurate and horizontal position, and that can reduce the generation of dust when the wafers are loaded and unloaded.

[0013]

[Means to Solve the Issues] In order to solve the issues described above, the present invention is characterized in that such a container has support rib segments arranged in such a way that they face one another and are comprised of multi-layers so that disk-shaped thin plates can be supported in many layers, and in an equal distance from one thin sheet from another; that the support container, where one end of the opening part thereof is arranged to allow said thin plates to be introduced or unloaded, can allow said rib segments to be arranged in an increased space throughout the entire length of the thin sheet and formed thinly so that said thin plates can be easily introduced or unloaded, wherein a support convex part that supports the thin plates from downward, which are inserted internally from the point, where the straight line passing toward the direction of the loading/lead-out diagonally through the center of gravity of the internally inserted thin plates meets individual support ribs that are arranged to face one another, to one side of said rib segments of said loading/lead-out part; and that the inner most side of said rib segments has a inner most support part, which controls the insertion depth limit of the thin plates by supporting the thin plates from the inner location thereof, wherein as said thin plates contact the inner most support part and are inserted to the limit point, which allows the container to horizontally support the thin plates by this inner most support part and said support convex part.

[0014]

[Effects] By the construction described above, the rib segments of the loading part can be formed thin to allow the space between rib segments to be larger, providing easy loading and unloading of the thin plates, thus eliminated friction between the thin plates and support container.

[0015] Additionally, since the thin plates are supported by the support convex part that supports the thin plates from downward, which are inserted internally from the point, where the straight line passing toward the direction of the loading/unloading diagonally through the center of gravity of the internally

inserted thin plates meets individual support ribs that are arranged to face one another, to one side of said rib segments of said loading/unloading part, and the inner most support part arranged at the inner most of the rib segments, the thin plates can be supported in an accurate and horizontal manner, ensuring a complete insertion without having the forks of a robot contact the in-between of the thin plates.

[0016]

[Demonstrated Example] Illustration will follow regarding demonstrated examples according to the present invention with the assistance of the attached drawings. The support container for thin plates according to the present invention is a container that can support a plurality of thin plates such as semi-conductor wafers, storage disks, and liquid crystal panels, among other things in a parallel manner. In the following illustration, semi-conductor wafers will be used as an example of thin plates, and a carrier box for semi-conductor wafers will be used as an example of the support container for thin plates.

[0017] [The First Demonstration]

The overall construction of the carrier box for semi-conductor wafers 10 according to the present demonstration example is mostly the same with that of the above-mentioned carrier box for semi-conductor wafers 1. Specifically speaking, just as described in Figures 1 and 5, it is formed to be open at one end, being comprised of a body 12 having a wafer loading/unloading part 12A for a wafer 11, and a support rib 15 that are arranged in a plurality of layers inside the pair of side boards 13 and 14 facing each other inside the body 12.

[0018] The body 12 is constructed in such a way that the facing side boards 13 and 14 are connected and supported via a top articulated board 16 and a bottom articulated board 17 one another. The body 12 is to be placed vertically with the bottom of the bottom articulated board 17 being the base. The bottom parts of individual side boards 13 and 14 has a horizontal support board part 18 that serves as a base level 18A for supporting the body 2 to have the wafers 11 horizontal when the body is placed vertically. The wafer loading and unloading part 12A is an opening part that loads and unloads the wafers 12, and is designed to be a little larger in dimension than the maximal diameter of the disk wafers.

[0019] Individual support ribs 15 are comprised of a plurality of rib segments 15A that are arranged in a parallel manner at a constant space on the inside of the side boards 13 and 14. The support rib 15 is comprised of a loading part

20 located on the side of the wafers' loading and unloading part 12A, an alignment part 21 located deep inside of the loading part 20, and the inner support part 22 located at the inner most position, which regulates the insertion limit of the wafers 11 as well as supports the wafers 11 from the inner position. In order for the loading and unloading of the wafers 11 to be easy in and out the box, the loading part 20 is formed to be thin, just as can be seen in the prior art, with its taper forming an acute angle to provide a wider space between the ribs (see also Figure 4).

[0020] Just as Figure 6 shows, at the alignment part 21 are the rib segments 15A that is formed to be thick with its taper forming an dull angle, providing a narrower space between the ribs. The thickness of the rib segments 15A (an angle of the taper) is set in such a way that the wafers 11 that has been completely inserted to the inner most position comes in parallel with the base level 18A. Therefore, when the wafers 11 are inserted to the inner most position in the box, these wafers 11 are supported by four (4) points, that is, the maximal outer diameter points 25 and 25(ref. to fig. 5), along with the inner support parts 22 and 22; when the wafers 11 are supported by the four (4) points, the alignment of the top surface of the rib segments 15A is set so that the wafers 11 come in parallel with the base level 18A. Incidentally, since the wafers 11 are disks, the position that corresponds to the center of gravity of the wafers 11 should be the maximal outer diameter points 25 and 25.

[0021] In addition, the bottom part of the rib segments 15A is designed to be allowed to have such a reasonable space that the movement of the wafers 11 to the right and left can be regulated at the maximal outer diameter of the wafers 11 by decreasing the space between adjacent two (2) rib segments 15A. Moreover, the alignment part 21 is to be extended from said maximal outer diameter 25 and 25 slightly toward said wafers' loading and unloading part 12A.

[0022] When inserting the wafers 11 to the carrier box 10 for semi-conductor wafers constructed in the aforementioned manner, these wafers 11 are to be supported by the forklift 8 (see also Figure 3) horizontally, get moved to the insertion point, and eventually inserted to the inside of the box 10. In this case, the height of the rib segments 15A part of the alignment part 21 is arranged so as not to contact the maximal outer diameter of the wafers 11, and the rib segments 15A are arranged not to be contacted when the wafers 11 are inserted.

[0023] With this alignment being maintained, the wafers 11 are inserted to the inside of the box 10 until they contact the inner support part 22. Since the space of the rib segments 15A is large at the loading part 20, insertion can be performed easily. When the wafers 11 are inserted to contact the inner support part 22, the forklift 8 moves downward slightly, allowing the wafers 11 to be placed to the rib segments 15A of the alignment part 21. At this state, the wafers 11 are supported by the inner support part 22 and the alignment part 21, their movement to right and left being regulated by the top and bottom sides of the rib segments 15A while their movement back and forth is regulated by the inner support part 22, respectively; providing horizontal positioning of the wafers' 11, and allowing the interval distance between individual wafers 11 to be uniform.

[0024] When extracting the wafers 11 that have been stored in multiple layers inside the box 10, insert said forklift 8 between individual wafers 11. In this case, since each wafer 11 is maintained to be horizontal position, thus uniform space distance between individual wafers 11, the forklift 8 never contacts the wafers 11. When the forklift 8 penetrates to the inner position, it gets moved slightly upward to lift the wafers 11. Then, the forklift 8 gets extracted externally, followed by the wafers 11 being unloaded. In this case, the amount of upward movement of the wafers 11 by the forklift 8 is designed in such a way that the maximal outer diameter part of these wafers' 11 should not contact the bottom surface of the rib segments 15A of the alignment part 21. Incidentally, even when the wafers 11 were positioned astray causing contact, the alignment part 21 is formed up until the maximal diameter points 25 and 25, so the fricative part between the alignment part 21 and the wafers 11 would be nothing more than an infinitesimal distance.

[0025] Just as discussed above, since the carrier box for semi-conductor wafers 10 according to this demonstrated example can support the wafers 11 in an accurate and horizontal position, dust generation due to loading and unloading of the wafer 11s and contact in various locations can be prevented.

[0026] In addition, even when inserting the fork 8, the wafer 11s and the fork 8 never contacts each other, ensuring complete prevention of occurrences such as damages to the wafer 11s, and down of production among other things.

[0027] [The Second Demonstration]

The overall construction of the carrier box for semi-conductor wafers 31 according to the present demonstration example is the same with that of the

above-mentioned first demonstration example. In this 2nddemonstration example, just as Figure 7 shows, the construction of the support ribs 32 is different. In other words, the overall rib segments 33, comprising the support ribs 32, are formed to be thin, and the distance between the rib segments 33 is wider at large. And, just as Figure 7 shows, the rib segments 33 have a support convex part 34 to maintain the wafers 11 horizontal position. This support convex part 32 is to be placed in the neighborhood (slightly toward the wafers' loading and unloading part 12A) of the maximal outer diameter points 25 and 25, in other words, the position where the straight line passing toward the direction of the loading/unloading diagonally through the center of gravity of the internally inserted wafers 11 meets individual support ribs 32 to one side of said rib segments 33 of said loading/unloading part; these two (2) support convex parts 34 and the inner support part 22 collaboratively support the wafers 11 at the four (4) points. Since the support convex part 34 is sufficient as far as the wafers 11 can be supported in the neighborhood of the maximal outer diameter points 25 and 25, even a slight width (width toward the major length of the rib segments 15A) will do. So will a relatively large width.

[0028] This support convex part 34 is formed in a wedge-like shape, whose top surface is to be horizontal while the facing pair of the support convex part 34 should have the same height. In addition, this support convex part 34 has the same height with that of the inner support part 22.Therefore, the wafers 11 can be supported by the four (4) points, that is, the inner support part 22 and the support convex part 34, wherein a slight movement to the right or left does not affect the horizontal horizontal stability.

[0029] By the construction as described above, the similar effects can be achieved just as the first demonstration example above.

[0030] Incidentally, in each demonstration example above, semi-conductor wafers 11 are used to exemplify the thin plates; however, not limited to these, similar effects can be achieved even with other support containers for, for example, aluminum-memory storage disks, glass-made container for liquid crystal memory boards.

[0031] Moreover, in said individual demonstration examples, the wafers 11 are to be supported by the four (4) points including the inner support part 22; however, without arranging this inner support part 22, but a construction by preparing only parts that are parallel to each other (the parts corresponding to the loading part 20 and the alignment parts 21 in the first demonstration

example) can achieve similar effects as shown above. In this case, the wafers 11 would be supported by the four (4) points, the alignment part 21. In the second demonstration example, four (4) of the support convex part 34 would be necessary. This is particularly effective when rectangular shapes are to be supported such as liquid crystal boards.

[0032] In the first demonstration example, the alignment part 21 is arranged slightly toward the wafers' loading and unloading side from the maximal outer diameter points 25 and 25; however, this could be arranged larger to the side of the wafers' loading and unloading part 12A.

[0033] Moreover, the parts where the rib segments 15A are to be thick in the alignment part 21 is directed to the overall major length of the rib segments 15A; however, these could be arranged within the neighborhood of the maximal outer diameter points 25 and 25.

[0034] In the second demonstration example, a wedge-shaped support convex part 34 is arranged; however, just as Figure 8 shows, a projective support convex part 35 will do, as well. In this case, as well, the similar effects can be achieved as the second demonstration example.

[0035] Furthermore, the support convex part 34 is arranged on one side (on the top surface of the rib segments 15A); however, it could be arranged on both sides (on the top and bottom surfaces facing the rib segments 15A). In this case, when taking out the individual wafers 11 from the inner support part 22 after laying down the box 10 (which means that the wafers' loading and unloading part 12A faces up), the wafers 11 does not tremble, providing an easy extraction.

[0036] In addition, as a support convex part 34, just as shown in Figure 9, a shape that inclines downward the inner most point of the rib segments 33 as a support convex part 36 could be used, as well. The positioning of this support convex part 36 could be either within the neighborhood of the maximal outer diameter points 25 and 25, or entire one. In this case, since the bottom surface of the wafers 11 is supported by the support convex part 36, top of the wafers 11 comes close to the bottom surface of the rib segments 33, regulating the horizontal movement of the wafers 11, thus preventing the wafers 11 from being inclined.

[0037]

[Effects of the Invention] Just as discussed above, by using the support container for thin plates, thin plates can be supported in an accurate and

horizontal location, and when loading or unloading the thin plates, generation of dust due to, for example, contact between the thin plate and container, can be reduced.

Description of Drawings

[Simplified Illustration of the Drawings]

[Figure 1] A partial cut out view, showing the carrier box for semi-conductor wafers related to the present invention.

[Figure 2] A partial cut out view, showing the carrier box for semi-conductor wafers of the existing type.

[Figure 3] A flat view, showing a forklift.

[Figure 4] A partial cross-sectional diagram, showing the position where a wafer is placed in the carrier box of the existing type.

[Figure 5] A horizontal cross-sectional diagram of the carrier box for semi-conductor wafers as illustrated in Figure 1.

[Figure 6] A partial cross-sectional diagram, showing the position where a wafer is placed in the carrier box in the first demonstration.

[Figure 7] A partial cross-sectional diagram, showing the position where a wafer is placed in the carrier box in the second demonstration.

[Figure 8] A partial cross-sectional diagram, showing a variation example of the second demonstration.

[Figure 9] A partial cross-sectional diagram, showing another variation example of the second demonstration.

[Description of the Numbered Items]

10 --- Carrier box for semi-conductor wafers.

11 --- Semi-conductor wafer.

12 --- Body.

12A --- Loading/unloading of the wafer.

13, 14 --- Side board.

15 --- Support rib.

15A --- Rib segment.

18 --- Horizontal support board part.

18A --- Base level.

20 --- Loading part.

21 --- Alignment part.

22 --- Inner most support part.